

REMARKS

Claims 1-14 are pending.

Claim Rejection – 35 USC § 103

Claims 1-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gelernt (US Patent No. 6,369,398) in view of Kleinschmidt (US Patent No. 6,160,832) and further in view of Makinouchi (US Patent No. 6,490,025). Applicant respectfully traverses this rejection for at least the following reasons.

Claim 1 recites a lithographic projection apparatus comprising, *inter-alia*, an acoustic sensor constructed and arranged to detect sounds caused by the passage of pulses of radiation of the projection beam.

Claim 13 recites an integrated circuit device manufacturing method comprising, *inter-alia*, detecting one of: sounds caused by the passage of pulses of radiation of said projection beam; vibrations in an object on which said projection beam is incident, and sounds emitted by an object on which said projection beam is incident.

By detecting sounds caused by the passage of pulses of radiation, a direct and in situ measurement of the projection beam intensity and/or changes of the projection beam intensity at, for example, the substrate level is determined. This allows, for example, to achieve accurate dose control of radiation reaching the substrate.

The Office Action concedes that Gelernt '398 does not disclose, teach or suggest the use of an acoustic sensor to detect sounds caused by the passage of pulses of radiation of the projection beam.

In response to Applicant's argument that there is no suggestion in either Gelernt or Kleinschmidt that the lithographic exposure system of Gelernt can be modified to use an acoustic detection device in accordance with Kleinschmidt et al., the Office Action directs the Applicant to a section in Gelernt reference which discusses selecting a lithographic wavelength so as to minimize intensity attenuation due to air absorption.

However, Gelernt is merely concerned about selecting a wavelength at which the absorption of ultraviolet radiation by molecular oxygen is minimized. According to Gelernt, if lithography is performed at an irradiating wavelength around the selected wavelength, the stringent requirement for high vacuum or inert gas purge system can be relaxed. Since the absorption spectrum of molecular oxygen is generally known to one of skill in the art, Gelernt

selects a wavelength in the VUV range at which the absorption by molecular oxygen is at its minimum. Consequently, Gelernt does not need an acoustic detection device to select a wavelength of ultraviolet radiation which corresponds to a minimum absorption of molecular oxygen. Therefore, Gelernt does not disclose or suggest anywhere using an acoustic detection device, such as a microphone, to find the minimum in VUV intensity absorption.

Therefore, the Applicant respectfully maintains that there is no suggestion in either Gelernt or Kleinschmidt that the lithographic exposure system of Gelernt can be modified to use an acoustic detection device in accordance with Kleinschmidt et al.

Furthermore, one of ordinary skill in the art would not have been motivated to use a microphone as disclosed in Kleinschmidt, i.e., merely for wavelength calibration of an Excimer laser, in the lithographic apparatus of Gelernt as Gelernt does not disclose or suggest anywhere the possibility of using an acoustic device to measure ultraviolet radiation intensity and Kleinschmidt does not disclose or suggest that the photoacoustic detector can be used in a lithographic apparatus. Indeed, Kleinschmidt merely uses a microphone for wavelength calibration of an Excimer laser.

With regard to claim 5, the Office Action concedes that Gelernt in view of Kleinschmidt et al. does not disclose the use of a vibration sensor mechanically coupled to an object on which the projection beam is incident.

Makinouchi et al. does not overcome the deficiencies noted above in Gelernt and Kleinschmidt. In addition, Makinouchi et al. merely discloses using a vibration sensor for detecting vibrations (accelerations) of a body due to movement of wafer and mask stages. Makinouchi does not disclose, teach or suggest to measure acoustic vibrations caused by the passage of radiation pulses.

In response to the arguments filed on December 22, 2003, the Office Action directs Applicant's to col. 5, line 29-35 in which Makinouchi uses an acceleration sensor (vibration sensor) and interpreted that the use of a vibration sensor in accordance with Makinouchi is equivalent to the use of a vibration sensor as recited in claim 5. Applicant respectfully disagrees.

The vibration sensor in Makinouchi is merely used to detect relatively high amplitude vibrations (accelerations) of a body due to movement of wafer and mask stages whereas the acoustic sensor as recited in claim 5 is adapted to detect sounds, i.e. low amplitude vibrations emitted by an object on which a beam of radiation is incident. Furthermore, the high

amplitude vibrations (accelerations) in Makinouchi and the low amplitude sound vibration detected by the acoustic sensor of claim 5 lie in very different frequency ranges. Therefore, the vibration sensor of Makinouchi cannot be used to detect acoustic vibrations.

Consequently, for at least the above reasons, Applicant submits that none of Gelernt, Kleinschmidt et al. and Makinouchi et al., taken alone or in combination, disclose, teach or suggest the subject matter recited in claim 5.


Therefore, Applicant respectfully submits that claims 1 and 13, and claims 2-12 and 14, which are dependent from either claim 1 or claim 13, are patentable. Thus, Applicant respectfully requests that the rejection of claims 1-14 under § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,
PILLSBURY WINTHROP LLP

By: 
Robert C. Perez
Reg. No.: 39,328
Tel. No.: (703) 905-2159
Fax No.: (703) 905-2500

RCP/KG

00909
P.O. BOX 10500
McLean, VA 22102
(703) 905-2000